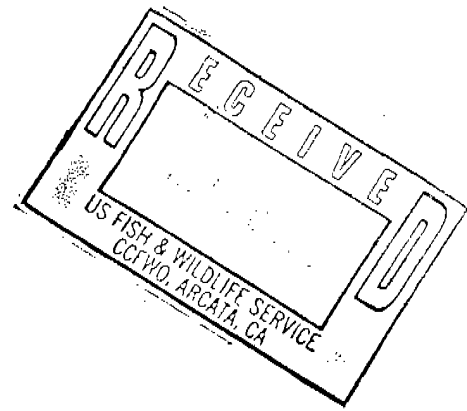


Bruce Halstead
US Fish and Wildlife Service
1125 16th Street, Room 209
Arcata, CA 95521

005516



John Munn
California Department of Forestry
1416 Ninth Street Sacramento, CA 95814

Re: Headwaters Forest Acquisition and the Draft Palco Habitat Conservation Plan and Sustained Yield Plan and Supporting Draft Environmental Impact Report/Environmental Impact Statement

November 2, 1998

I am a professor emeritus of forest (plant) pathology from the University of California, Berkeley. I served on the faculty for about 30 years beginning in 1963 in a position that involved forest disease research and teaching both undergraduate and graduate students in forestry, forest pathology and related fields. Most of my research was field related and much of it was done on the north coast of California. Hence, I have experience with diseases of north coast trees and believe that I have observations germane to the Sustained Yield Plan and Habitat Conservation Plan proposed by PALCO.

Before acquisition of the company, Pacific Lumber appeared to have enough redwood forest to sustain a 300 year rotation if the level of harvest remained approximately level. This meant that the company could, and probably would, sustain a very desirable diversity of plant and animal life. By most people's definition of old growth forests, 300-year-old stands of redwood would qualify. Through maintaining a high level of diversity, many values would be retained in the presence of harvesting - if done appropriately. One value would be forest health, including reduced levels of diseases and insects, compared to forest stands managed at a 120 year rotation.

On page 3.9 - 15, the plan mentions two heart rot fungus of older redwood trees but goes on to state that no diseases or insects cause death of mature trees (redwoods). This is not true, but there have been no well-designed, definitive studies on the subject. I personally have observed extensive root damage to windblown, old-growth redwoods caused by annosum root rot. The damage was so extensive on some that I strongly believe the trees failed during the windstorm because of the rot. The biology of the fungus, Heterobasidion annosum, suggests that it may be an even greater problem under intensive management. The heartrots also move into the roots, and I have observed Armillaria sp. there too. As for the younger trees and sprouts,

FWC-
1

FWC-
2

many are attacked by canker-causing fungi that cause blighting and death. In 1971, John Davidson completed a PhD dissertation (UCB) on the subject, and I think that it should have been referenced in this plan. As I recall, much of the blighting occurred in clear cuts.

FWC-
2
CON-

Relative to Douglas fir, the plan states correctly that it is attacked by many pests, both fungi and insects. However, it omits several pathogens or groups of pathogens that could impact Douglas fir if the environment is adversely altered. Two groups that stand out due to their absence are the foliage pathogens and the canker-causing fungi. Potentially, intensive management practices could cause an increase in both of these groups. No mention is made of (Leptographium wagneri, cause of black stain root disease. I believe that this is a significant oversight because; 1) it is already having a substantial impact on Douglas fir on the north coast and; 2) research has shown that thinning, road building and harvest activities increase the impact.

FWC-
3

Historically, the composition/diversity of a forest ecosystem is the product of all the environmental factors, both biotic and abiotic, that are operating within that system. If enough intensive management or other human impact, the composition and diversity of the forest is changed, the activities of both pathogens and insects can be expected to change, and almost always for the worse. There are numerous examples but I will point to only two: Letographium wagneri and Heterobasidion annosum. I would hope that such factors could be included in such a SYP as PALCO has prepared.

Sincerely,

Fields W Cobb

Fields W. Cobb, Jr. *by PC*
4429 Lakeshore Drive
Sagle ID 83860

FIELDS W. COBB, JR.
Professor, University of California at Berkeley

CA PROF. REG. FOR. #1184

BIRTHDATE AND PLACE: 2/16/32, Key West, FL; raised in Dendron, VA.

EDUCATION:

Surry High School, Surry, VA
B.S. Forest Management, 1955, North Carolina State Univ.
M.F. Forestry, 1956, Yale University
Ph.D. Plant Pathology, 1963, Pennsylvania State University.

HONOR AND SOCIETY MEMBERSHIPS:

Gamma Sigma Delta, Xi Sigma Pi, Phi Epsilon Phi, Alpha Zeta, Phi Sigma, Sigma Xi,
Blue Key, Golden Chain, American Phytopathological Society, Society of American
Foresters.

MAJOR RESEARCH INTERESTS:

Rusts and root diseases of forest trees, especially those caused by *Peridermium harknessii*,
Ophiostoma wageneri, and *Heterobasidion annosum*; epidemiology and control of forest
tree diseases; disease-insect interactions, interactions between disease and soil, stand and
site factors; roles of disease in the forest ecosystem, and the effects of human activities on
disease severity.

EXPERIENCE:

1993- present	Professor Emeritus of Plant Pathology, UC Berkeley
1982-1993:	Professor of Plant Pathology, UC Berkeley
1970-1982:	Associate Professor of Plant Pathology, UC Berkeley
1963-1970:	Assistant Professor of Plant Pathology, UC Berkeley
1962-1963:	Instructor, Pennsylvania State University
1958-1962:	Research Assistant, Pennsylvania State University
1955-1957:	Research Forester/Pathologist, U.S. Forest Service, Southeastern and Southern Forest Experiment Station.

TEACHING ACTIVITIES:

Primary responsibilities involve instruction in forest tree diseases at both graduate and
undergraduate levels, including interactions with insects and other components of forest
ecosystems. Also, there is substantial involvement in courses in pest management, conservation
and resource studies, mycology and forest ecology.

CONSULTING ACTIVITIES:

As a faculty member with an approximately 70% appointment in the Agricultural Experiment
station, unreimbursed extension activities represent a significant obligation. These activities
include consultation with various State and Federal Agencies, including the California Departments
of Forestry and Parks and Recreation, U.S. Forest Service and the National Park Service, local
agencies such as the East Bay Regional Park District and the City of Lafayette (Tree Commission)
and with both timber companies and private land owners. The above consultations have usually
involved diseases, insects and other problems with trees in forests and urban situations. Some
have involved hazardous tree problems and their solutions. In addition, I have been involved in
litigation involving trees that have failed and caused bodily injury or property damage.

EXHIBIT A

A. Refereed Research Articles

1. 1961 Cobb, F. W., Jr., C. L. Fergus, and W. J. Stambaugh. The effect of temperature on ascogonium and perithecium development in *Ceratocystis fagacearum*. *Mycologia* 53:91-97.
2. 1964 Cobb, F. W., Jr. and C. L. Fergus. Pathogenicity, host specificity, and mat production of seven isolates of the oak wilt fungus. *Phytopathology* 54:865-866.
3. 1964 Cobb, F. W., Jr. and R. A. Schmidt. Duration of susceptibility of eastern white pine stumps to *Fomes annosus*. *Phytopathology* 54:1216-1218.
4. 1965 Cobb, F. W., Jr., F. A. Wood, and R. A. Schmidt. Occurrence of *Ceratocystis fagacearum* in wounds on red and chestnut oaks. *Phytopathology* 55:179-182.
5. 1965 Cobb, F. W., Jr., C. L. Fergus, and W. J. Stambaugh. Factors affecting infection of red and chestnut oaks by *Ceratocystis fagacearum*. *Phytopathology* 55:1194-1199.
6. 1967 Cobb, Fields W., Jr. and William D. Platt. Pathogenicity of *Verticicladiella wagnerii* to Douglas fir. *Phytopathology* 57:998-999.
7. 1967 Cobb, Fields W., Jr. and W. Wayne Wilcox. Comparison of susceptibility of *Abies concolor* and *Pinus Ponderosa* wood to decay by *Fomes annosus*. *Phytopathology* 57:1312-1314.
8. 1968 Cobb, F. W., Jr. and D. R. Miller. Hosts and geographic distribution of *Scirrhia pini* - the cause of red band needle blight in California. *J. For.* 66:930-934.
9. 1968 Cobb, F. W., Jr. and W. B. Libby. Susceptibility of Monterey, Guadalupe Island, Cedros Island, and Bishop pines to *Scirrhia pini*, the cause of red band needle blight. *Phytopathology* 58:88-90.
10. 1968 Cobb, F. W., Jr., M. Krstic, H. Zavarin, and H. W. Barber, Jr. Inhibitory effects of volatile oleoresin components on *Fomes annosus* and four *Ceratocystis* species. *Phytopathology* 58:1327-1335.
11. 1968 Cobb, F. W., Jr. and H. W. Barber, Jr. Susceptibility of freshly-cut stumps of redwood, Douglas fir and ponderosa pine to *Fomes annosus*. *Phytopathology* 58:1551-1557.
12. 1968 Stark, R. W., P. R. Miller, F. W. Cobb, Jr., and D. L. Wood. Photochemical oxidant injury and bark beetle (Coleoptera:Scolytidae) infestation of Ponderosa pine. I. Incidence of bark beetle infestation in injured trees. *Hilgardia* 39:121-126.

A. Refereed Research Articles cont.

13. 1968 Cobb, F. W., Jr., D. L. Wood, R. W. Stark, and P. R. Miller. Photochemical oxidant injury and bark beetle (Coleoptera:Scolytidae) infestation of Ponderosa pine. II. Effect of injury upon physical properties of oleoresin, moisture content, and phloem thickness. *Hilgardia* 39:127-134.
14. 1968 Miller, P. R., F. W. Cobb, Jr., and E. Zavarin. Photochemical oxidant injury and bark beetle (Coleoptera:Scolytidae) infestation of Ponderosa pine. III. Effect of injury upon oleoresin composition, phloem carbohydrates and phloem pH. *Hilgardia* 39:135-140.
15. 1968 Cobb, F. W., Jr., D. L. Wood, R. W. Stark, and J. R. Parmeter, Jr. Photochemical oxidant injury and bark beetle (Coleoptera:Scolytidae) infestation of Ponderosa pine. IV. Theory on the relationships between oxidant injury and bark beetle infestation. *Hilgardia* 39:141-152.
16. 1970 Zavarin, Eugene and Fields W. Cobb, Jr. Oleoresin variability in *Pinus ponderosa*. *Phytochemistry* 9:2509-2515.
17. 1970 Cobb, Fields W., Jr. and R. W. Stark. Decline and mortality of smog-injured ponderosa pine. *J. For.* 68:147-149.
18. 1971 Helms, J. A., F. W. Cobb, Jr., and H. S. Whitney. Effect of infection by *Verticicladiella wagnerii* on the physiology of *Pinus ponderosa*. *Phytopathology* 61:920-925.
19. 1971 Hunt, R. S. and F. W. Cobb, Jr. Selective medium for the isolation of wood-rotting basidiomycetes. *Can. J. Bot.* 49:2064-2065.
20. 1971 Zavarin, Eugene, Fields W. Cobb, Jr., John Bergot, and Hollis W. Barber. Variation of the *Pinus ponderosa* needle oil with season and needle age. *Phytochemistry* 10:3107-3114.
21. 1972 Cobb, Fields W., Jr., Eugene Zavarin, and John Bergot. Effect of air pollution on the volatile oil from leaves of *Pinus ponderosa*. *Phytochemistry* 11:1815-1818.
22. 1972 Byler, J. W., F. W. Cobb, Jr., and J. R. Parmeter, Jr. Occurrence and significance of fungi inhabiting galls caused by *Peridermium harknessii*. *Can. J. Bot.* 50:1275-1282.
23. 1972 Byler, J. W., F. W. Cobb, Jr., and J. R. Parmeter, Jr. Effects of secondary fungi on the epidemiology of western gall rust. *Can. J. Bot.* 50:1061-1066.
24. 1972 Byler, J. W. and F. W. Cobb, Jr. The occurrence and pathogenicity of *Nectria fuckeliana* on dwarf mistletoe in California. *Can. J. Bot.* 50:1172.

A. Refereed Research Articles cont.

25. 1972 Whitney, H. S. and F. W. Cobb, Jr. Non-staining fungi associated with the bark beetle *Dendroctonus brevicomis* (Coleoptera:Scolytidae) on *Pinus ponderosa*. Can. J. Bot. 50:1943-1945.
26. 1974 Hunt, R. S., W. W. Wilcox, and F. W. Cobb, Jr. Resistance of stump tops to colonization by *Fomes annosus*. Can. J. For. Res. 4:140-142.
27. 1976 Hunt, Richard S., Fields W. Cobb, Jr., and J. R. Parmeter, Jr. *Fomes annosus* stump colonization and fungus development in the California mixed-conifer type. Can. J. For. Res. 6:159-165.
28. 1977 Alvarez, Isabel F. and Fields W. Cobb, Jr. Mycorrhizae of *Abies concolor* in California. Can. J. Bot. 55:1345-1350.
29. 1978 Goheen, D. J., F. W. Cobb, Jr., and G. N. McKibbin. Influence of soil moisture on infection of ponderosa pine by *Verticicladiella wagnerii*. Phytopathology 68:913-916.
30. 1978 Goheen, Donald J. and Fields W. Cobb, Jr. Occurrence of *Verticicladiella wagnerii* and its perfect state, *Ceratocystis wagnerii* sp. nov., in insect galleries. Phytopathology 68:1192-1195.
31. 1979 Alvarez, Isabel F., David L. Rowney, and Fields W. Cobb, Jr. Mycorrhizae and growth of white fir seedlings in a mineral soil with or without organic layers in a California forest. Can. J. For. Res. 9:311-315.
32. 1980 Hicks, F. R., F. W. Cobb, Jr., and P. L. Gersper. Isolation of *Ceratocystis wagnerii* from forest soil with a selective medium. Phytopathology 70:880-883.
33. 1980 James, R. L., F. W. Cobb, Jr., P. R. Miller, and J. R. Parmeter, Jr. Effects of oxidant air pollution on susceptibility of pine roots to *Fomes annosus*. Phytopathology 70:560-563.
34. 1980 James, R. L., F. W. Cobb, Jr., W. W. Wilcox, and D. L. Rowney. Effects of photochemical oxidant injury of ponderosa and Jeffrey pines on susceptibility of sapwood and freshly-cut stumps to *Fomes annosus*. Phytopathology 70:704-708.
35. 1980 Goheen, D. J. and F. W. Cobb, Jr. Infestation of *Ceratocystis wagnerii*-infected ponderosa pines by bark beetles (Coleoptera:Scolytidae) in the central Sierra Nevada. Can. Entomol. 112:725-730.
36. 1982 Cobb, F. W., Jr., G. W. Slaughter, D. C. Rowney, and C. J. DeMars. Rate of spread of *Ceratocystis wagneri* in ponderosa pine stands in the central Sierra Nevada. Phytopathology 72:1359-1362.

A. Refereed Research Articles cont.

37. 1982 Hunt, R. S., and F. W. Cobb, Jr. Potential arthropod vectors and competing fungi of *Fomes annosus* in pine stumps. *Can. J. of Plant Pathology* 4:247-253.
38. 1982 James, R. L., F. W. Cobb, Jr., and J. R. Parmeter, Jr. Effects of ozone on sporulation, spore germination, and growth of *Fomes annosus*. *Phytopathology* 72:1205-1208.
39. 1982 James, R. L. and F. W. Cobb, Jr. Variability in virulence of *Heterobasidion annosum* isolates from ponderosa and Jeffrey pine in areas of high and low photochemical air pollution. *Plant Disease* 66:835-837.
40. 1983 Harrington, T. C., C. Reinhart, D. A. Thornburgh, and F. W. Cobb, Jr. Association of black-stain root disease with precommercial thinning of Douglas-fir. *Forest Sci.* 29:12-14.
41. 1983 Harrington, T. C. and F. W. Cobb, Jr. Pathogenicity of *Leptographium* and *Verticicladiella* spp. isolated from roots of western North American conifers. *Phytopathology* 73:596-599.
42. 1983 Worrall, J. J., J. R. Parmeter, Jr., and F. W. Cobb, Jr. Host specialization of *Heterobasidion annosum*. *Phytopathology* 73:304-307.
43. 1984 Harrington, T. C. and F. W. Cobb, Jr. Host specialization of three morphological variants of *Verticicladiella wagneri*. *Phytopathology* 74:286-290.
44. 1984 Harrington, T. C. and F. W. Cobb, Jr. *Verticillium albo-atrum* on *Ceanothus* in a California forest. *Plant Disease* 68:1012.
45. 1984 James, R. L. and F. W. Cobb, Jr. Spore deposition by *Heterobasidion annosum* in forests of California. *Plant Disease* 68:246-248.
46. 1983 Wilks, D. S., P. L. Gersper, and F. W. Cobb, Jr. Relation of soil redox potential to infection of ponderosa pine by *Ceratocystis wagneri*. *Phytopathology* 73:1120-1125.
47. 1985 Wilks, D. S., P. L. Gersper, and F. W. Cobb, Jr. Association of soil moisture with spread of *Ceratocystis wagneri* in ponderosa pine disease centers. *Plant Disease* 69:206-208.
48. 1985 Harrington, T. C., F. W. Cobb, Jr. and J. Lownsbery. Activity of *Hylastes nigrinus*, a vector of *Verticicladiella wagneri*, in thinned stands of Douglas-fir. *Can. J. For. Res.* 15:519-523.

A. Refereed Research Articles, cont.

49. 1985 Goheen, D. J., F. W. Cobb, Jr., D. L. Wood, and D. L. Rowney. Visitation frequencies of some insect species on *Ceratocystis wagneri*-infected and apparently healthy ponderosa pines. *Canadian Ent.* 117:1535-1543.
50. 1986 Harrington, T. C. and F. W. Cobb, Jr. Varieties of *Verticicladiella wagneri*. *Mycologia* 78:562-567.
- * 51. 1987 Otrosina, W. J. and F. W. Cobb, Jr. Analysis of allozymes of three distinct variants of *Verticicladiella wagneri* isolated from conifers in western North America. *Phytopathology* 77:1360-1363.
- * 52. 1987 Harrington, T. C. and F. W. Cobb, Jr. *Leptographium wagneri* var. *pseudotsugae* var. nov., cause of black stain root disease on Douglas-fir. *Mycotaxon* 30:501-507.
- * 53. 1988 Otrosina, W. J., T. E. Chase, F. W. Cobb, Jr. and J. W. Taylor. Biological species and host specialization in *Heterobasidion annosum*, casual organism of annosus root rot. *Northwest Environmental Journal* 4:335-336.
- * 54. 1991 Waters, W. E., C. J. Demars, Jr., F. W. Cobb, Jr. Analysis of early mortality of douglas-fir seedlings in post-harvest plantings in Northwestern California. *Forest Science*: 37:802-826.

IN PRESS

- * 55. 1991 Otrosina, W. J., T. E. Chase and F. W. Cobb, Jr. Allozyme differentiation of intersterility groups of *Heterobasidion annosum* isolated from western conifers. *Phytopathology* 82:000-000.
- * 56. 1991 Vogler, D. R., B. B. Kinloch, F. W. Cobb, Jr. and T. L. Popenuck. Genetic structure of an endemic forest pathogen: western gall rust of pine. *Can. J. of Botany* 69:000-000.

B. Book Chapters, Symposia, and Review Articles

1. 1967 Cobb, F. W., Jr. Ecology of *Fomes annosus* (Fries) Karst. *Proc. 13th Conf. on Control of Soil Organisms*.
2. 1967 Cobb, F. W., Jr., and D. R. Miller. *Scirrhia pini* in California: distribution and disease cycle. Pp. 92-93 *In: Proc. 14th Western Int. For. Dis. Work Conf.*
3. 1968 Cobb, F. W., Jr. Diseases as factors predisposing ponderosa pine to bark beetle infestations. *Proc. 19th Western For. Insect Work Conf.*
4. 1974 Cobb, F. W., Jr., J. R. Parmeter, Jr., D. L. Wood, and R. W. Stark. Root pathogens as agents predisposing ponderosa pine and white fir to bark beetles. Pp 8-15 *In:*

* Appeared since last review

1/30/92

B. Book Chapters, Symposia, and Review Articles cont.

Proc. 4th Intl. Conf. on *Fomes annosus*. Intl. Union of Forestry Research Organizations, vol. 4.

5. 1974 Srago, M. D. and F. W. Cobb, Jr. The influence of soil biological factors on the mycelial growth of *Fomes annosus*. Pp. 221-226 In: Proc. 4th Int. Conf. on *Fomes annosus*. Intl. Union of Forestry Research Organizations, vol 4.
6. 1974 Wood, D. L., F. W. Cobb, Jr., D. J. Goheen, L. E. Browne, H. A. Moeck, and R. W. Stark. Host selection by bark beetles (Coleoptera:Scolytidae) in the mixed conifer forests of California. In: Symp. on the Host Plant in Relation to Insect Behavior and Reproduction. Tihang, Hungary, June 11-14.
7. 1975 James, R. L., F. W. Cobb, Jr., J. R. Parmeter, Jr., P. R. Miller, and N. Bruhn. Effects of photochemical air pollution on forest pathogens. Pp. 140-151 In: Photochemical Air Pollution Effects on Mixed Conifer Forest Ecosystems--A Progress Report. U.S. Environ. Protect. Agency, Corvallis, OR.
8. 1977 Cobb, F. W., Jr., R. L. James, N. L. Bruhn, and J. R. Parmeter, Jr. Effects on epidemiology of forest tree pathogens. Pp. 147-159 In: Photochemical Oxidant Air Pollution Effects on a Mixed Conifer Forest Ecosystem--A Progress Report, 1974-75. US Environ. Protect. Agency, Corvallis, OR. EPA-600/3-77-058
9. 1977 Bruhn, J. N., J. R. Parmeter, Jr., and F. W. Cobb, Jr. Effects on microbial activity in needle litter decomposition and nutrient cycling. Pp. 190-198 In: Photochemical Oxidant Air Pollution Effects on a Mixed Conifer Forest Ecosystem--A Progress Report, 1974-75. US Environ. Protect. Agency, Corvallis, OR. EPA-600/377-058.
10. 1977 Cobb, F. W., Jr., R. L. James, and J. R. Parmeter, Jr. Effects on root pathogen dynamics and stand mortality subsystems. Pp. 177-185 In: Photochemical Oxidant Air Pollution Effects on a Mixed Conifer Forest Ecosystem--A Progress Report, 1976, Sect. 11. US Environ. Protect. Agency, Corvallis, OR. EPA-600/3-77-104.
11. 1977 Cobb, F. W., Jr., N. L. Bruhn, D. L. Rowney, and J. R. Parmeter, Jr. Effects on tree seedling establishment subsystems. Pp. 186-190 In: Photochemical Oxidant Air Pollution Effects on a Mixed Conifer Forest Ecosystem--A Progress Report, 1976, Sect. 12. US Environ. Protect. Agency, Corvallis, OR. EPA-600/3-77-104,
12. 1976 Cobb, F. W., Jr. and J. R. Parmeter, Jr. Modeling of plant pathogen populations in the forest ecosystem. Pp. 165-167 In: R. L. Tummala, D. L. Haynes, and B. A. Craft, eds. Modeling for Pest Management: Concepts, Techniques and Applications Mich. State Univ.
13. 1978 Byler, J. F., F. W. Cobb, Jr., D. Dahlsten, and J. R. McBride. A forest-wide survey of pests and pest complexes associated with tree mortality on the San Bernardino National Forests. P. 17 In: Workshop Proc.: Simulation Modeling of Oxidant Air Pollution Effects on Mixed Conifer Forests and the Possible Role of Models in

B. Book Chapters, Symposia, and Review Articles cont.

- Timber Management Planning for Southern California National Forests. Statewide Air Pollution Res. Center, Univ. Calif., Riverside, and For. Serv., USDA.
14. 1978 Cobb, F. W., Jr. Establishment of pine seedlings in relation to oxidant exposure, surface litter and other site conditions. P. 22 *In: Workshop Proc.: Simulation Modeling of Oxidant Air Pollution Effects on Mixed Conifer Forests and the Possible Role of Models in Timber Management Planning for Southern California National Forests.* Statewide Air Pollution Res. Center, Univ. Calif., Riverside, and For. Serv., USDA.
 15. 1978 Cobb, F. W., Jr. and R. L. James. Effects of photochemical oxidants on the epidemiology of *Fomes annosus*. P. 16 *In: Workshop Proc.: Simulation Modeling of Oxidant Air Pollution Effects on Mixed Conifer Forests and the Possible Role of Models in Timber Management Planning for Southern California National Forests.* Statewide Air Pollution Res. Center, Univ. Calif., Riverside, and For. Serv., USDA.
 16. 1979 Parmeter, J. R., Jr., M. Srago, N. J. MacGregor, and F. W. Cobb, Jr. Root disease, hazard, and forest protection in Yosemite Valley. Pp. 1087-1100 *In: Proc. 1st Conf. Sci. Res. in the Nat. Parks, New Orleans, Nov. 9-12, 1976.* Park Serv. Trans. and Proc. Series, vol. 5.
 17. 1979 Cobb, F. W., Jr. and R. L. James. Forest tree pathogen epidemiology subsystem. Pp. 115-121 *In: P. C. Taylor, ed. Photochemical Oxidant Air Pollution Effects on a Mixed Conifer Forest Ecosystem--Final Report, 1977.* Statewide Air Pollution Res. Center, Univ. Calif., Riverside, chapt. 8.
 18. 1979 McBride, J. R., D. L. Dahlsten, and F. W. Cobb, Jr. Cause and extent of tree mortality. Pp. 132-135 *In: P. C. Taylor, ed. Photochemical Oxidant Air Pollution Effects on a Mixed Conifer Forest Ecosystem--Final Report, 1977,* chapt. 9. Statewide Air Pollution Res. Center, Univ. Calif., Riverside.
 19. 1979 Cobb, F. W., Jr. Tree seedling establishment subsystem. Pp. 136-142 *In: P. C. Taylor, ed. Photochemical Oxidant Air Pollution Effects on a Mixed Conifer Forest Ecosystem--Final Report, 1977,* chapt. 10. Statewide Air Pollution Res. Center, Univ. Calif., Riverside.
 20. 1980 Bruhn, J. N., J. R. Parmeter, Jr., and F. W. Cobb, Jr. Oxidant impact on ponderosa and Jeffrey pine foliage decomposition. Pp. 229 *In: Proc. Symp. on Effects of Air Pollutants on Mediterranean and Temperate Forest Ecosystems.*
 21. 1981 Harrington, T. C., F. W. Cobb, Jr., C. Reinhart, and D. A. Thornburgh. Association of black stain root disease with precommercial thinning of Douglas fir. Pp. 75-76 *In: Proc. 29th Western Int. For. Dis. Work Conf.* Vernon, B.C.

B. Book Chapters, Symposia, and Review Articles cont.

22. 1984 Cobb, F. W. Jr. Management of ponderosa pine and Douglas-fir stands with black stain root disease. Pp. 44 In: Summaries of the Proceedings of the 1984 Western Forestry Conference. Sacramento, CA, December 3-5, 1984.
23. 1985 Wood, D. L., R. W. Stark, W. E. Waters, W. D. Bedard, and F. W. Cobb, Jr. Treatment tactics and strategies. Pp. 121-140 In: W. E. Waters, R. W. Stark and D. L. Wood, eds. Integrated Pest Management in Pine-Bark Beetle Ecosystems, chapt. 6. Wiley Interscience, N.Y., N.Y.
- * 24. 1988 Chase, T. E., R. C. Ullrich, W. J. Orosina, F. W. Cobb, Jr. and J. W. Taylor. Genetics of intersterility in *Heterobasidion annosum*. Pp. 11-17 In: Proceedings of the I.U.F.R.O. Seventh International Conference on Root and Butt Rots. Vernon and Victoria, B. C., Canada, August 9-16.
- * 25. 1988 Cobb, Jr., F. W. Interactions among root disease pathogens and bark beetles in coniferous forests. Pp. 142-148 In: Proceedings of the I.U.F.R.O. Seventh International Conference on Root and Butt Rots. Vernon and Victoria, B. C., Canada, August 9-16.
26. 1988 Cobb, Jr., F. W. *Leptographium wageneri*, cause of black-stain root diseases: A review of its discovery, occurrence and biology with emphasis on pinyon and ponderosa pine. Pp. 41-62 In: T. C. Harrington and F. W. Cobb, Jr., eds. *Leptographium* Root Diseases of Conifers. APS Press.
- * 27. 1988 Orosina, William J., Thomas E. Chase, Fields W. Cobb, Jr. and John W. Taylor. Isozyme structure of *Heterobasidion annosum* isolates relating to intersterility genotype. Pp. 406-416 In: Proceedings of the I.U.F.R.O. Seventh International Conference on Root and Butt Rots. Vernon and Victoria, B. C., Canada, August 9-16.
- * 28. 1988 James, R. L. and F. W. Cobb, Jr. Interactions between photochemical air pollution and *Heterobasidion annosum* in a mixed conifer forest ecosystem. Pp. 513-520 In: Proceedings of the I.U.F.R.O. Seventh International Conference on Root and Butt Rots. Vernon and Victoria, B. C., Canada, August 9-16.
- * 29. 1989 Chen, M.-M., F. W. Cobb, Jr., W. J. Libby, and D. R. Vogler. Evidence of variability in pathogenicity among isolates from an isozymically monomorphic population of western gall rust. Pp. 95-106 In: Proc. 36th Ann. Western Int. Forest Disease Work Conf. Park City, Utah, September 19-23, 1988.
- * 30. 1989. Chen, M.-M. and F. W. Cobb, Jr. Epidemiology of white pine blister rust in young sugar pine plantations in the Central Sierra Nevada of California. Pp. 1-3 and 1-4 In: Abstracts of Beijing Int'l Symp. of Plant Pathology. The Chinese Society for Plant Pathology, Beijing, China, Sept. 1-5, 1988.

* Appeared since last review

1/30/92

B. Book Chapters, Symposia, and Review Articles cont.

31. 1989 Otrosina, W. J. and F. W. Cobb, Jr. Biology, ecology, and epidemiology of *Heterobasidion annosum*. Pp. 26-33 In: Proc. of Symp. on Research and Management of Annosus Root Disease (*Heterobasidion annosum*) in Western North America. USDA, Forest Serv., Pacific Southwest Forest & Range Exp. Sta. General Tech. Report PSW-116.

C. Non-Refereed Research Articles

1. 1957 Cobb, Fields W., Jr. A test of the application of existing site index curves to the flatwoods slash pine type. Southeastern For. Exp. Sta. Res. Note 20, 3 p.
2. 1957 Cobb, Fields W., Jr. Pitch streak, a disease of turpented slash pine. Naval Stores Rev. 67:4-5.
3. 1960 Cobb, Fields W., Jr. and D. A. Clark, Jr. Class III milk in the New York milkshed. I. Manufacturing operations. USDA Mktg. Res. Rept. 379, 36 p., illus.
4. 1961 Fergus, C. L., W. J. Stambaugh, F. W. Cobb, Jr., and R. A. Schmidt. The effect of conidial concentration on perithecial formation by the oak wilt fungus. Plant Dis. Repr. 57:736-738.
5. 1962 Stambaugh, W. F., F. W. Cobb, Jr., R. A. Schmidt, and F. C. Krieger. Seasonal inoculum dispersal and white pine stump invasion by *Fomes annosus* (preliminary report). Plant Dis. Repr. 46:194-198.
6. 1967 Parmeter, J. R., Jr. and F. W. Cobb, Jr. Diseases and the management of young-growth stands in California. Proc. Conf. on Young-Growth For. Management in California:124-127.
7. 1967 Parmeter, J. R., Jr. and F. W. Cobb, Jr. Inoculation of Monterey pine with dwarf mistletoe from bishop pine. Plant Dis. Repr. 57:856.
8. 1969 Stark, R. W. and F. W. Cobb, Jr. Smog injury, root diseases and bark beetle damage in ponderosa pine. Calif. Agric. 23:13-16.
9. 1971 Hunt, R. S., J. R. Parmeter, Jr., and F. W. Cobb, Jr. A stump treatment technique for biological control of forest root pathogens. Plant Dis. Repr. 55:659-662.
10. 1974 Piirto, D. D., J. R. Parmeter, and F. W. Cobb, Jr. *Fomes annosus* in giant sequoia. Plant Dis. Repr. 58:478.
11. 1979 Byler, J. W., F. W. Cobb, Jr., and D. L. Rowney. An evaluation of black stain root disease on the Georgetown Divide, El Dorado County. USDA, For. Serv., Reg. 5 Rept. No. 79-2. 15 p.

C. Non-Refereed Research Articles, cont.

12. 1983 Cobb, F. W., Jr. and A. H. McCain. Black Stain Root Disease, 3 p. UC Agr. Ext. Serv.
13. 1985 Waters, W. E., F. W. Cobb, Jr., and C. J. DeMars, Jr. Preliminary investigation of life-table analysis of destructive agents affecting survival of young Douglas-fir in plantations. Final Report, Coop. Agreement PSW-84-0013 CA., 30 p.
14. 1986 Adams, David H. and F. W. Cobb, Jr. Infection of outplanted Douglas-fir seedlings by *Verticicladiella wagneri* (Black Stain Root Disease) when planted around infected Douglas-fir stumps. California Department of Forestry, Calif. For. Note No. 98, 11 pp.
- * 15. 1988 Waters, William E, Fields W. Cobb, Jr. and C. J. DeMars, Jr. Study of factors affecting survival and growth of Douglas-fir seedlings in the north coast regions of California. Berkeley, CA Department of Forestry and Resources Management, 1988. 191 pp. (Cooperative agreement nos. PSW-84-0013-CA and PSW-85-0014-CA).

IN PRESS

- * 16. 1991 Hecht-Poinar, E., F. W. Cobb, Jr., and R. D. Raabe. Twig blight of California oaks, should there be concern? Pp. In: California Agriculture Experiment Station Report. Funded by the Slosson Foundation. (In press.)

D. Abstracts

1. 1962 Stambaugh, W. J., F. W. Cobb, Jr., R. A. Schmidt, and F. C. Krieger. Effects of season and environment on inoculum dispersal of *Fomes annosus* and stump invasion of planted white pine. *Phytopathology* 52:28.
2. 1963 Cobb, F. W., Jr., R. A. Schmidt, C. L. Fergus, and F. A. Wood. Sporulation of *Ceratocystis fagacearum* in wounds on infected oak trees. *Phytopathology* 53:348.
3. 1965 Skelly, J. M., F. A. Wood, and F. W. Cobb, Jr. Inoculation of one year-old twigs of red oaks with *Ceratocystis fagacearum*. *Phytopathology* 55:131.
4. 1966 Cobb, Fields W., Jr. and J. R. Parmeter, Jr. Invasion of conifer stumps by *Fomes annosus* in California. *Phytopathology* 56:874.
5. 1967 Cobb, F. W., Jr., M. Krstic, and E. Zavarin. Effect of pine resin and turpentine constituents on *Fomes annosus* and four species of *Ceratocystis*. *Phytopathology* 57:806-807.
6. 1968 Cobb, F. W., Jr., B. Uhrenholdt, and J. A. Murray. Aerial dispersal of *Dothistroma pini* spores. *Phytopathology* 58:1047.

* Appeared since last review

1/30/92

D. Abstracts, cont.

7. 1969 Cobb, F. W., Jr. and J. W. Byler. Fungi associated with galls caused by *Peridermium harknessii*. *Phytopathology* 59:1020.
8. 1969 Cobb, F. W., Jr., B. Uhrenholdt, and R. F. Krohn. Epidemiology of *Dothistroma pini* needle blight on *Pinus radiata*. *Phytopathology* 59:1021.
9. 1973 Nelson, D. L., F. W. Cobb, Jr., and J. R. Parmeter, Jr. Susceptibility of southeastern hard pine to gall rust from California. 2nd Int. Cong. Plant Pathol., Minneapolis, Abstr. No. 0700.
10. 1974 Goheen, D. J. and F. W. Cobb, Jr. Soil moisture as a factor affecting infection of ponderosa pine by *Verticicladiella wagnerii*. *Proc. Amer. Phytopathol. Soc.* 1:111.
11. 1975 Goheen, D. J. and F. W. Cobb, Jr. Attack of *Pinus ponderosa* by bark beetles subsequent to infection by *Verticicladiella wagnerii*. 59th Annual Meeting, Pacific Div., Amer. Phytopathol. Soc., June 15-18.
12. 1975 James, R. L., F. W. Cobb, Jr., P. R. Miller, and J. R. Parmeter, Jr. Effects of ozone on infection and colonization of ponderosa and Jeffrey pine seedlings by *Fomes annosus*. *Proc. Amer. Phytopathol. Soc.* 2:2115.
13. 1976 James, R. L., F. W. Cobb, Jr., and J. R. Parmeter, Jr. Effects of photochemical air pollution injury on the susceptibility of ponderosa and Jeffrey pine roots to *Fomes annosus*. *Proc. Amer. Phytopathol. Soc.* 3:227.
14. 1976 James, R. L., F. W. Cobb, Jr., and J. R. Parmeter, Jr. Influence of photochemical air pollution injury on susceptibility of freshly-cut pine stumps to *Fomes annosus*. *Proc. Amer. Phytopathol. Soc.* 3:267.
15. 1977 Bruhn, J., J. R. Parmeter, Jr., and F. W. Cobb, Jr. Oxidant air pollution and pine litter decomposition. *Proc. Amer. Phytopathol. Soc.* 4:84.
16. 1977 James, R. L., F. W. Cobb, Jr., and J. R. Parmeter, Jr. Influence of ozone on the growth and conidial production and germination of *Fomes annosus*. *Proc. Amer. Phytopathol. Soc.* 4:89.
17. 1978 James, R. L. and F. W. Cobb, Jr. Pathogenic variability of *Fomes annosus* isolates. *Phytopathol. News* 12:166.
18. 1979 Hicks, B. R., F. W. Cobb, Jr., and P. L. Gersper. Effects of environmental factors on growth of *Ceratocystis wagnerii* through soil. *Phytopathology* 69:1031.
19. 1981 Harrington, T. C. and F. W. Cobb, Jr. Infra-specific variants of *Verticicladiella wagneri*. *Phytopathology* 71:879.

D. Abstracts cont.

20. 1982 Harrington, T. C. and F. W. Cobb, Jr. Host specificity within *Verticicladiella wagneri*. *Phytopathology* 72:966.
21. 1983 Cobb, F. W., Jr. Disease impact on natural forests. *Phytopathology* 73:774.
22. 1983 Cobb, F. W., Jr., D. J. Goheen, and T. C. Harrington. Black stain root disease caused by *Verticicladiella wagneri*. Fourth Internat. Congress of Plant Path., Melbourne, Aug. 17-24, 1983, Abstracts of Papers, p. 84.
23. 1983 Parmeter, J. R., Jr. and F. W. Cobb, Jr. Disease management in mixed conifer forests of western North America. Fourth Internat. Congress of Plant Path., Melbourne, Aug. 17-24. Abstracts of Papers, p. 81.
24. 1984 Cobb, F. W., Jr. and David Adams. Infection of outplanted Douglas-fir seedlings by *Verticicladiella wagneri*. *Phytopathology* 84:824 (Abstr.).
25. 1985 Chen, Mo-Mei, F. W. Cobb, Jr., and R. Heald. White pine blister rust in young sugar pine plantations in the mid-elevation Sierra Nevada. *Phytopathology* 75:1367.
26. 1986 Lawson, T. T. and F. W. Cobb, Jr. Stand and site conditions associated with mortality by *Verticicladiella wagneri* in Mendocino County, California. (Abstr.) *Phytopathology* 76:1057.
27. 1986 Otrrosina, W. J. and F. W. Cobb, Jr. Electrophoretic characteristics of three *Verticicladiella wagneri* variants. *Phytopathology* 76:845.
- * 28. 1987 Diamandis, S., L. Epstein, and F. W. Cobb, Jr. Germination of conidia of *Verticicladiella wagneri* on root surfaces. *Phytopathology* 77:1238. (Abstr.)
- * 29. 1987 Vogler, D. R., B. B. Kinloch, F. W. Cobb, Jr. and T. L. Popenuck. Isozyme patterns in *Endocronartium harknessii* from several pine hosts and stands in California. *Phytopathology* 77:1242.
- * 30. 1987 Cobb, Jr., F. W., T. T. Lawson, and T. L. Popenuck. Interactions among the three variants of *Verticicladiella wagneri* and the three host types. *Phytopathology* 77:1717.
- * 31. 1987 Lawson, T. T. and F. W. Cobb, Jr. Growth reductions in young Douglas-fir infected with *Verticicladiella wagneri*. *Phytopathology* 77:1360.
- * 32. 1987 Lawson, T. T. and F. W. Cobb, Jr. Pathological heartwood foundation in pole-sized Douglas-fir infected with *Verticicladiella wagneri*. *Phytopathology* 77:1727.
- * 33. 1987 Otrrosina, W. J., F. W. Cobb, Jr., and T. Popenuck. Variation in virulence within host specific variants of *Verticicladiella wagneri*. *Phytopathology* 77:1757.

* Appeared since last review